

An Overview of the
Missouri Forest Action Plan





Introduction

Have you ever wondered how many trees are in Missouri, or who owns the woods in the state? Perhaps you've had concerns about the health of the trees and woods in your area. Have you questioned which trees are the most important to Missouri, and why? Are you curious about the benefits our forests offer to whitetail deer, wild turkey, songbirds, and other wildlife? Well, you are not alone. Professional foresters ask the same questions—and now, we have answers to many of them, as well as a plan to begin to address many of the issues our forests face.

Missouri's forests are under increasing pressures: recent discoveries of new non-native and invasive insects, diseases, and plants; unplanned development and land clearing that results in loss of forest and fragmented habitat for wildlife; and increased demand for wood caused by new uses and markets for forest products. The Missouri Department of Conservation has completed an assessment of Missouri's forests that evaluated statewide forest conditions and how they relate to threats and opportunities influencing forest health and productivity. Working with interested individuals and organizations, the project developed strategies and actions that address concerns uncovered during the assessment; the result is the **Missouri Forest Action Plan**. The goal of the plan is to provide a road map toward sustaining our forests for the well-being of our kids, grandkids, and future generations.

The Missouri Forest Action Plan has three top priorities: 1) conserving working forest landscapes, 2) protecting forests from harm, and 3) enhancing public benefits from trees and forests. The Plan has revealed that our forest resource is at a crossroads: while it is increasingly threatened, it offers tremendous potential for helping to address some of our most pressing social and environmental challenges.

For our purposes here, the terms “forest” and “forest resource” are all-inclusive of trees in towns, the woods on your property, and publicly owned forestland.

Properly addressing our forest's threats and opportunities is far more than any one agency or organization can tackle on its own. This complex task will require unprecedented levels of collaboration and partnership between conservation agencies, nongovernmental organizations, the forest industry, and dedicated individuals. It also demands increased public awareness of the importance of our trees, woods, and forests, and the public must be involved in activities that enhance their sustainability. Most importantly, the Plan is a call to action. This booklet introduces the Plan and its strategies, and it shows the amazing benefits our forest provides to each citizen. We also hope it will inspire everyone to go outdoors and enjoy Missouri's forests!



Developing the Forest Action Plan

The Assessment Process

Starting with state and federal goals for forest conservation and sustainability, 11 key “Issue Themes” were developed by MDC’s Forestry Division and were then thoroughly vetted by stakeholders (interested organizations and individuals). The Issue Themes organize and describe the threats and opportunities facing Missouri’s forest resources.

Then, “Desired Future Conditions” (DFCs) were established for each Issue Theme to help provide direction for developing strategies to address the issue. As with the Issue Themes, the DFCs were developed by MDC’s Forestry Division and then vetted by stakeholders. In this booklet, we call DFCs “Goals.”

“Conditions, Trends, Threats, and Opportunities” describe the challenges and opportunities for achieving the DFCs. These were researched and summarized by MDC’s Forestry Division. Stakeholders contributed ideas and reviewed draft documents.

Forest Opportunity Areas and Multistate Priority Areas were established as the best geographic areas for strategically addressing assessment findings. These priority areas were developed by MDC Forestry staff using considerable data provided by stakeholders. Priority areas were vetted through stakeholders.

Strategy Development

Assessment findings were used to develop a list of 77 individual strategies that will be utilized to best achieve the DFCs (the goals). This list was developed by MDC’s Forestry Division staff and interested stakeholders, then vetted by stakeholders.

Once the strategies were developed, a system was created to provide key information for each strategy: 1) example action items, 2) target geographies, 3) issue themes and DFCs supported, 4) criteria and indicators supported, 5) national priorities, objectives, and performance measures supported, 6) key potential stakeholders, 7) resources needed, and 8) measures of success. This “Strategy Matrix” was developed by MDC’s Forestry Division in order to help guide implementation of the strategies.



Finding Opportunities by Weighing Benefits and Vulnerabilities

In order to identify the best geographic opportunities for sustaining Missouri's forest resources, a **Forest Opportunity Model** was developed. This helps us evaluate conservation "opportunity" a quarter-acre at a time across the state, balancing the forest's benefits (what the forest provides), against its vulnerabilities (condition, threats, and management needs).

"Forest Benefits and Attributes" include factors such as biodiversity, biological productivity, the ability to store atmospheric carbon dioxide, benefits to soil and water quality, recreational and social value for people, and the size of the forest. "Forest Vulnerabilities" include any current pressures to harvest the trees, threats by insects and diseases, and projections about encroaching housing and other human development.



Our statistical model weighs the "benefits and attributes" of a forest against its "vulnerabilities." The greatest conservation opportunities are in those areas where high benefits are combined with increased vulnerability. Our conservation efforts, in other words, have the highest "payoff" where a forest has great value and also seems to be fairly vulnerable.

An example of how this works is Labarque Creek watershed in Jefferson County. This watershed is especially important for biodiversity and public drinking water quality, but it is also under significant development pressure. This development pressure could be minimized through practices such as smart growth planning, conservation easements, and working with landowners. Therefore, this landscape is a good place to invest resources. Other areas may be just as ecologically important but are less vulnerable to degradation. Therefore, it is less urgent to invest resources in those places. Some other places might be even more vulnerable than Labarque Creek watershed but less able to provide important benefits. Therefore, they pose less opportunity as well.

What Are the Forest Opportunity Areas?

Rural Forest Opportunity Areas

Using the Forest Opportunity Model, we determined that the following areas present the greatest opportunities:

- The highest-scoring tier of quarter-acre areas from the Forest Opportunity Model.
- All riparian areas within 200 feet of permanent streams and 100 feet of intermittent streams.
- The highest-scoring tier of watersheds using the Forest Opportunity Model.
- Additional areas that uniquely promote established criteria for forest sustainability, upon approval of the State Forester.



Many of Missouri's Forest Opportunity Areas are also recognized as **Priority Forest Landscapes (PFLs)**. These are large landscapes (generally larger than 10,000 acres) of concentrated Forest Opportunity Areas. The PFLs will be used for strategic planning, stakeholder collaboration, and conservation marketing. All areas within a PFL are considered Forest Opportunity Areas.

The map at right shows the designated Forest Opportunity Areas and Priority Forest Landscapes. Approximately 50 percent of Missouri's existing forestland is recognized as Forest Opportunity Area.

Urban Forest Opportunity Areas

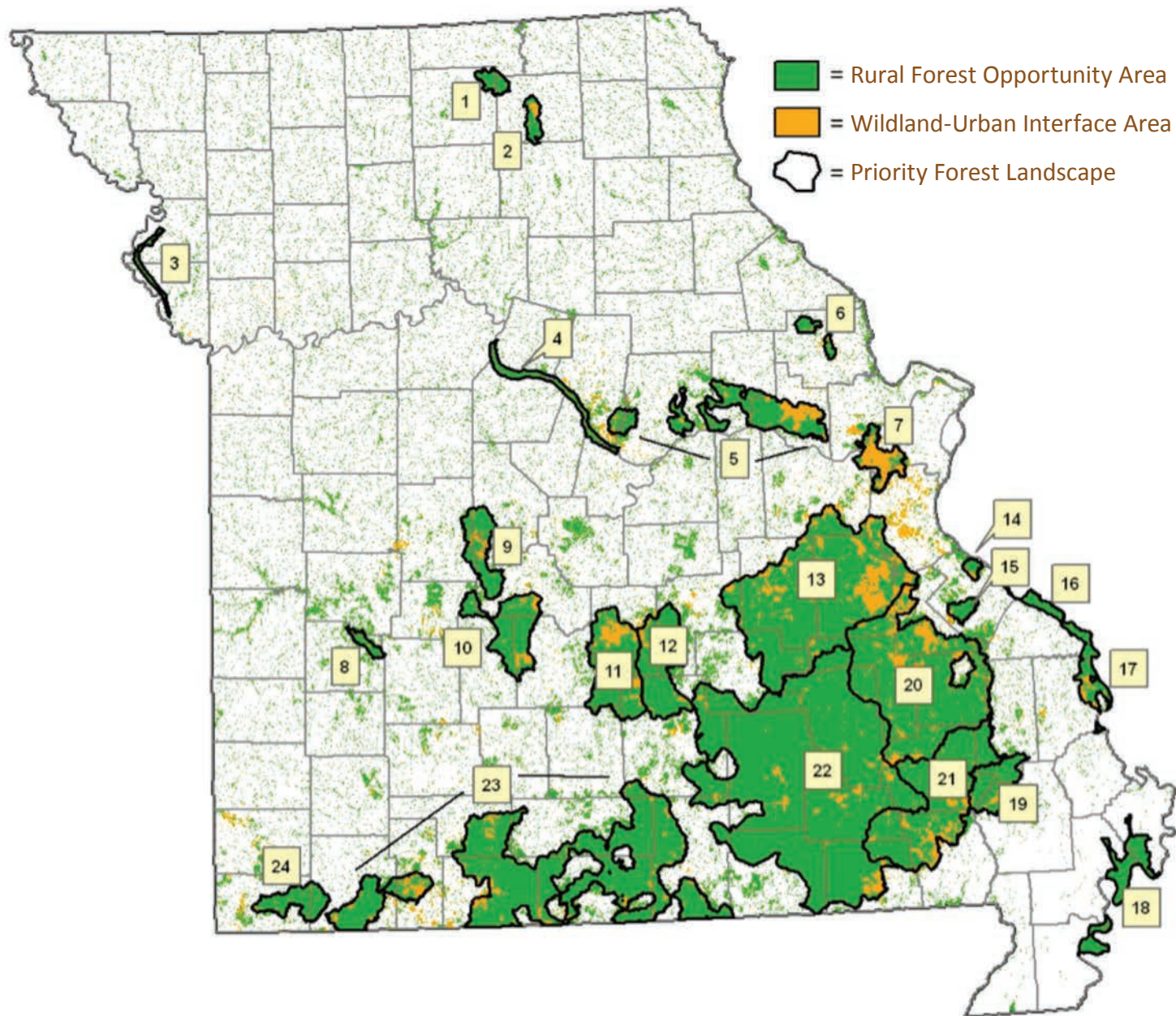
The issues, threats, and opportunities facing urban forests are often different from forests in rural areas. Therefore, a separate assessment is needed. Unfortunately, much of the data that would facilitate a high resolution urban forest assessment have not yet been developed. Therefore, the FAP identifies Urban Forest Opportunity Areas as Missouri's ten largest metropolitan areas, based on population and concentration of impervious surface.

Most FAP urban forest goals and strategies are oriented toward providing social benefits to people or improving environmental quality in the places where people live, work, and play. Therefore, FAP urban forest efforts will be focused on areas with the greatest concentrations of people.

Urban FOAs include areas in and around: St. Louis, Kansas City, Springfield, Columbia, Jefferson City, Joplin, St. Joseph, Lake of the Ozarks area, Branson, Cape Girardeau.

Distinct boundaries of urban forest opportunity areas are not delineated due to the variability of urban strategies. Efforts are currently underway to refine the designation of Missouri's Urban Forest Opportunity Areas.

Forest Opportunity Areas



Priority Forest Landscapes

1. Union Ridge
2. Thousand Hills Woodland
3. Iatan/Weston
4. Manitou Bluffs
5. Missouri River Hills
6. Cuivre River Hills
7. Lower Meramec/Missouri
8. Lower Sac
9. Lake of the Ozarks
10. Niangua Basin
11. Upper Gasconade
12. Big Piney
13. Meramec River Hills
14. Establishment Creek
15. Jonca Creek
16. Middle Mississippi
17. Cape Hills
18. River Bends
19. Mingo Basin
20. St. Francois Knobs
21. Black River Ozark Border
22. Current River Hills
23. White River Hills
24. Elk River Hills

1

Private Forest Landowner Demographic Trends and Keeping Forests as Forest

Missouri's family forest landowners are getting older, and this is increasing the vulnerability of our forests to unwanted changes. As lands change hands between family generations, increasing land prices, real estate taxes, economic hardships, and the next generation not being connected to the land or living far away are making it attractive to convert the forest to another land use, subdivide an ownership into smaller tracts for resale, or sell the property for development. These decisions can lead to unwanted results such as loss of forested land, smaller ownership size, urban sprawl, and physical fragmentation from more roads, buildings, and open spaces. In the face of these challenges we must develop creative solutions to help landowners maintain Missouri's forest resources.

Goals

- Having no net loss of Missouri's total forest acreage.
- Increasing the total amount of well-managed forestland in the priority areas identified in this plan.
- Large areas of continuous forest being maintained.
- Effective planning of new residential and commercial development to avoid destroying or harming important forest lands.
- When it changes ownership, privately owned forestland transitions smoothly to new owners who will continue or initiate sustainable forest management.
- Wide public recognition of the problems with subdividing larger forest ownerships and the need to reduce the frequency of such subdivision.
- Privately owned forest tracts remaining large enough to allow various management options or to have such options be possible across multiple adjoining ownerships.

Strategies

Forest Land Conservation

- Provide successional planning information to landowners to help facilitate the smooth and sustainable transition of property to the next generation of landowners.
- Focus development in less ecologically important areas, utilizing smart growth principles.
- Develop and implement a strategic forest land conservation program in order to protect tracts and forests of especially high public benefit.

Small Acreage Landowner Assistance

- Develop effective and efficient techniques for assisting small acreage landowners.





- According to a 2006 survey of Missouri family forest owners, 17% of Missouri's family woodlands is owned by people 75 years of age or older, and nearly 70 percent is owned by people 55 years of age or older.



It's important to maintain healthy wooded lands so that **Trees can Work** to provide the full range of benefits we depend on.

- 12.8 million acres (83%) of the woods in Missouri is privately owned.
- The most recent (2010) estimate of wooded land in Missouri is 15.5 million acres, nearly 6% greater than in 2005.

2

Challenges and Opportunities for Private Forest Landowners

Private forest landowners face a number of challenges and opportunities that affect their ability to manage their woods sustainably. Professional foresters, loggers, and contractors are not always readily available. Furthermore, taxes, ordinances, and forest investment costs can impact a landowner's ability to make management decisions based on long-term conservation objectives. Despite these challenges, new opportunities are developing such as ecosystem service markets, biofuels markets, and conservation easement programs. These and other factors could significantly change the economics associated with private forestland ownership and management.

Goals

- All Missourians recognizing and valuing the benefits provided by private forests, including clean water and air as well as forest products.
- Developing robust markets and incentives that will motivate private landowners to practice sustainable forest management.
- Minimizing property taxes and other barriers to maintaining sustainable forests on private lands.
- Having professional foresters, trained loggers, and contractors readily available to help private landowners manage their forests sustainably.

Strategies

Technical Assistance

- Increase the availability and credibility of quality foresters, loggers, and contractors who can help landowners set and achieve their objectives through sustainable forest management practices.
- Provide technical information, assistance, and financial help to private landowners enabling them to make and carry out informed management decisions leading to healthy and sustainable forests.

Ecosystem Service Markets, Programs, and Incentives

- Develop and promote markets for ecosystem services, such as carbon sequestration and clean drinking water, and incentives that make sustainable forest management a more affordable option for private landowners.

Private Landowner Awareness

- Increase awareness among private landowners of important forestry threats and opportunities and the importance of their properties to particular watersheds, landscapes, or initiatives.

Public Awareness

- Increase awareness of the general public and local decision makers of existing and potential ecosystem services offered by privately owned forests (such as clean drinking water) to encourage their support of programs enabling landowners to cost-effectively manage their forests sustainably for the greater public good.

Private Landowner Recognition

- Publicly recognize landowners who contribute significantly to forest conservation and sustainability.



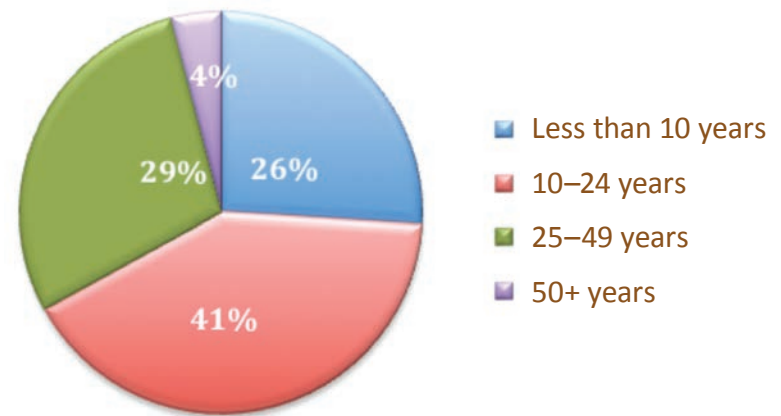


■ Approximately 10% of Missouri's family forest owners utilize assistance from a professional forester. Although much has been accomplished with this 10% of landowners, this leaves 90% of Missouri's family forestland without any professional guidance.

Missourians' most common reasons for owning forestland:

- Beauty/scenery
- Privacy
- Pass land on to heirs
- Nature protection
- Part of home or cabin

Family Forest Ownership Tenure (Percentage of Owners)



Trees Work for private landowners by providing wildlife habitat, sustainable periodic income, and inviting places for recreational pursuits.

3

Climate Change

It is uncertain how the climate change being predicted by climate models might take shape at local scales. We do not know what the future climate will be like in Missouri and how change might affect our forests and wildlife. Climate change can potentially shrink, expand, or shift the suitable habitat ranges of flora and fauna. The time scale of forest management in Missouri, usually a minimum of 100 years, makes it difficult to predict climate over the lifetime of a tree. The best course seems to be to manage our forests to be as resilient and adaptable as possible. This is best achieved by keeping forests vigorous, healthy, and as biologically diverse as possible. Forestry researchers are working diligently to try to understand what Missouri's future climate will look like, and what the impacts will be on Missouri's forests.

Goals

- Sustaining ecosystem services, such as filtering pollutants out of air and water, and providing wildlife habitat, as forests successfully adapt to changing climate.
- Forests contributing to mitigation of global climate change.
- Acquiring new scientific information, tools, and technology that increases understanding of climate change impacts, adaptation and mitigation options, and risks and uncertainties.

Strategies

Climate Change Adaptation Strategies

- Increase the adaptability of Missouri's forests to uncertain changes in climate.

Climate Change Mitigation Strategies

- Promote the role of forests and forest products in sequestering carbon and mitigating the potential effects of carbon emissions.

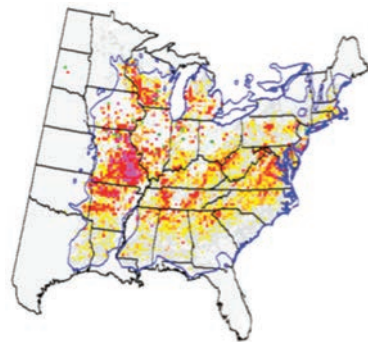
Climate Change Research Strategies

- Conduct research to increase our understanding of carbon sequestration, climate change, potential impacts, and management implications.

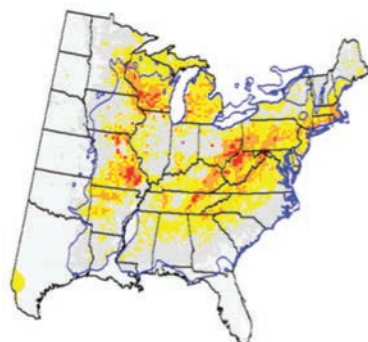


Current and Predicted Future Distribution of White Oak and Shortleaf Pine

White Oak

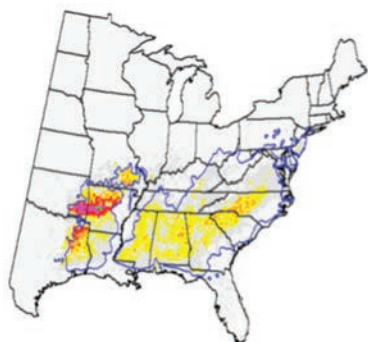


Current Modeled Distribution

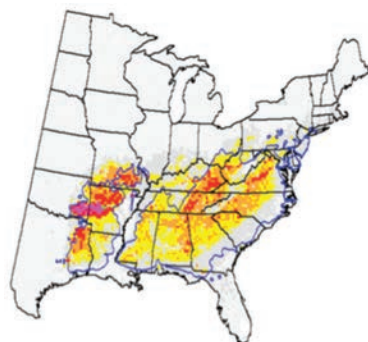


Predicted Future Habitat Suitability

Shortleaf Pine

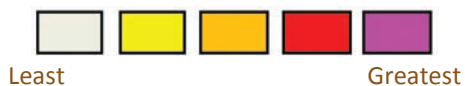


Current Modeled Distribution



Predicted Future Habitat Suitability

Map Key: Habitat Suitability



■ The USDA Forest Service Northern Research Station has developed a “Climate Change Tree Atlas” model that shows how the suitable habitat ranges of 135 different tree species could change due to climate change. At left are a couple of examples that are relevant to Missouri. Note the increase in suitable habitat for shortleaf pine and the large decrease in suitable habitat for white oak predicted for Missouri. One cannot be certain about tree species distributions in the future. However, these maps show some potential outcomes that should be considered as we shape our forestry program for the future.



Trees Work to reduce the effects of climate change by storing carbon and providing shade to moderate temperatures.

4

Maintaining High-Quality Soil and Water Resources

Trees and forests, when managed properly, are highly effective at conserving soil and water resources. Forested landscapes produce much of our cleanest and most cost effective drinking water. Riparian forests help hold stream banks in place and filter out pesticides, nutrients, and sediments before they can reach streams. Urban trees and forests minimize storm-water runoff and associated issues. In order to maintain and enhance the soil and water benefits of trees and forests, existing forest resources must be carefully managed, and reforestation along streams should be conducted in strategic locations. These same efforts will also help to ensure that soils will remain productive and abundant in the future.

Goals

- Healthy, forested watersheds providing high-quality, cost-effective drinking water, supporting vibrant aquatic ecosystems, and offering attractive areas for water-related recreation such as fishing and canoeing.
- Soil and water resources being protected through the widespread use of sustainable forest management practices, riparian forest buffers, and Best Management Practices.
- Minimizing urban storm-water runoff through the use of trees and forests.

Strategies

Best Management Practices

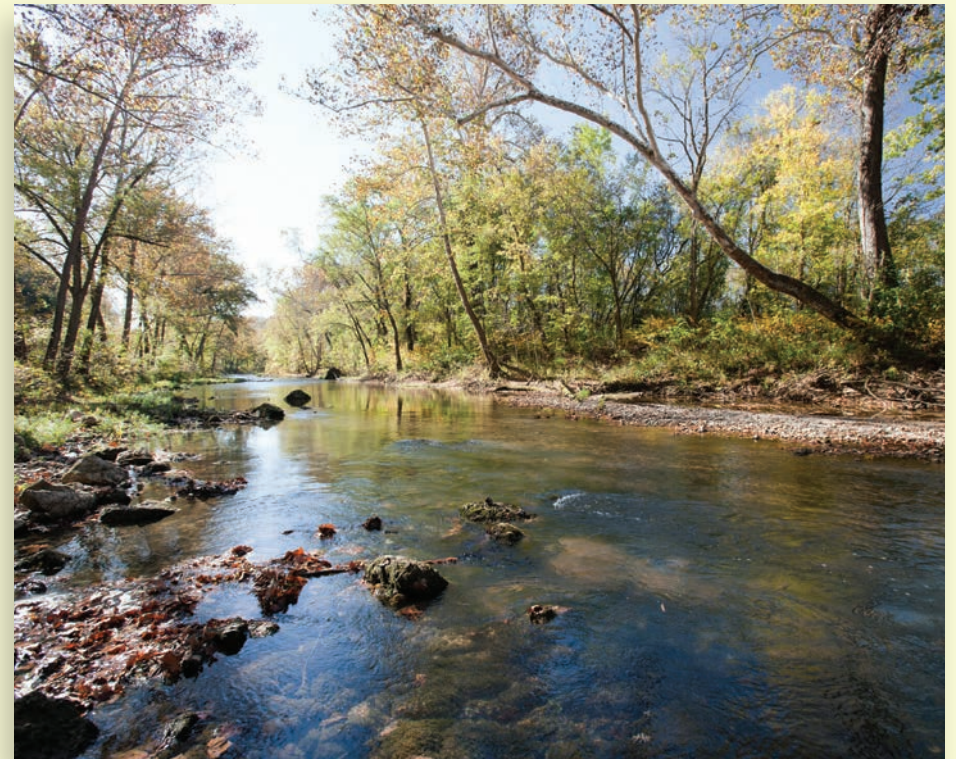
- Increase and improve the use of forestry Best Management Practices, which protect soil and water resources.

Riparian Forests and Wetlands

- Maintain existing riparian forests and wetlands, and reforest priority riparian areas and wetlands that have been converted from forest to nonforest use.

Coordination with Watershed Partnerships and Plans

- Utilize and promote watershed basin partnerships and plans that incorporate tree and forest strategies to benefit water quality and quantity.





■ A survey of 27 public drinking water suppliers conducted in 2002 found that for every 10% increase in forest cover in the source watershed, treatment and chemical costs decreased by approximately 20%, up to about 60% forest cover. Treatment costs level off when forest cover in a watershed is greater than 70%.

■ A Missouri Department of Conservation Forestry Division analysis shows that approximately 55% of Missouri's stream corridors are currently forested. Reforesting the nonforested riparian area would significantly benefit both the soil and water resource of the state.

■ The Missouri Department of Natural Resources' annual Census of Missouri Public Water Systems for 2012 shows that 47% of Missourians get their drinking water from a system with a primary water source in a stream or lake. The percentage swells to 64% when considering systems with a primary or secondary surface water source.



Trees Work to prevent soil erosion and protect water quality.

5

The Role of Fire in Missouri's Forests: Past, Present, and Future

Historically, fire played a significant role in shaping Missouri's forests and woodlands. Over the last century, Missouri has waged a highly successful campaign to reduce the number and size of wildfires. Although these efforts have done tremendous good in protecting people and property, the reduction in fire frequency from historic levels is allowing significant change to take place to the structure, diversity, and function of some forest and woodland communities. Since extensive, indiscriminant fires can no longer be tolerated, planned management practices (prescribed fire, mechanical thinning, and harvesting) are often needed in order to restore and maintain Missouri's forest resources in a healthy, productive, and wildlife-friendly condition.

Goals

- Minimizing the number and size of wildfires through prevention and suppression efforts, reducing their harmful effects on forests and on forest benefits.
- Effective fire prevention and information programs, resulting in fewer wildfires and safer communities.
- Developing and practicing sound prescribed fire techniques, restoring and maintaining fire-adapted landscapes and natural communities while minimizing negative impacts.

Strategies

Wildfire Prevention

- Minimize the occurrence and impact of wildfire through the use of prevention efforts.

Wildfire Suppression

- Suppress wildfires in order to protect people, property, and natural resources through effective collaboration between public agencies and fire departments.

Prescribed Fire

- Advance the science and understanding of prescribed fire in order to better quantify its effects and improve its effectiveness.
- Provide resources needed by private landowners to safely conduct prescribed fires without the assistance of public agency personnel.

Multiagency Collaboration and Preparedness

- Develop an active multiagency fire council to improve communication and collaboration concerning wildfire and prescribed fire.
- Develop Community Wildfire Protection Plans.
- Monitor fire weather and fuel conditions to determine fire risk and the appropriateness of prescribed fire, and communicate information to fire partners.
- Monitor wildfires and prescribed fires to determine their frequency, acreage, and spatial distribution.
- Maintain expertise in wildfire suppression and the use of prescribed fire in order to sustain proficiency and preparedness.

Public Awareness

- Increase public awareness of the benefits of carefully planned and executed prescribed fire, the harm of wildfire, and the differences between the two.





■ By far the single greatest cause of wildfires in Missouri is escaped debris fires. These are mostly fires where people are burning trash, leaves, or brush. Over the period from 2008 to 2012, a yearly average of 57% of Missouri wildfires for which a cause was reported were due to careless burning.

■ Depending on weather conditions, MDC annually conducts approximately 30,000 to 35,000 acres of prescribed burns on state-owned lands. These burns are used to create or maintain wildlife habitat that is dependent on disturbance such as fire.

Missouri Reported Natural Cover Wildfires, 2008–2012

Year	No. of Fires	Acres Burned
2008	1932	13,311
2009	4174	47,537
2010	3047	27,820
2011	3307	42,781
2012	4395	46,802



Fire can help, or hinder, a tree's effectiveness in delivering the benefits **Trees Work** to provide.

6

Missouri's Growth, Harvest, and Consumption of Forest Products

Missouri's forest products industry is an important contributor to Missouri's economy and influences the state's social and environmental conditions. Maintaining this important industry means carefully balancing harvest and consumption of forest products against available growth, and making sure that harvest practices account for long-term productivity and sustainability of all forest benefits and services.

Goals

- Sustainable, responsibly conducted timber harvesting that maintains and enhances the health, resilience, and productivity of forests and does not compromise other forest services and benefits.
- Missouri's forests and forest industry providing in-demand forest products (such as certified wood), contributing significantly to Missouri's economy and supporting the communities that depend on it.
- Missouri's forests producing a volume of forest products equivalent to the amount Missourians consume.
- Missourians being aware of how they use wood, how much they use, and where it comes from.

Strategies

Forest Product Markets

- Promote certified forests and certified forest products, which should encourage sustainable forest management on private lands and help maintain Missouri's market share in the forest products industry.
- Encourage better utilization of forest products in ways that motivate landowners to manage sustainably.
- Promote marketing and branding of Missouri-grown forest products.
- Steer emerging woody biomass markets, and other potential markets, in sustainable directions.

Timber Price Trends Monitoring

- Monitor and report timber price trends to track demand and improve trust between mills, loggers, and landowners.

Forester, Logger, and Mill Communications

- Improve communications between foresters, sawmills, and loggers, promoting understanding of each other's needs and expectations and increasing awareness of long-term impacts of management decisions.

Forest Health

- Develop partnerships between governmental agencies and private industry for minimizing forest health risks from plant, insect, and disease threats.

Consumers

- Encourage the wise consumption of forest products.





■ In 2009, Missouri's primary wood processors included 382 sawmills, 5 barrel mills, 9 post and pole mills, 4 charcoal plants, and 24 other mills producing miscellaneous products. The economic contribution of just the logging and primary processing industries to Missouri's economy in 2011 was \$1.4 billion, supporting 10,500 jobs at a payroll of about \$377 million. A broader definition of the forest products industry—including not only the primary processors but also secondary processors, furniture and cabinet makers, log cabins, and paperboard manufacturing—contributed \$7.3 billion to the economy and supported 41,200 jobs at a payroll of \$1.9 billion.

■ Red oaks, including scarlet oak, black oak, and northern red oak, were the most harvested trees in 2009, accounting for nearly half of the timber volume produced. White oaks were second at 28%, followed by hickory at 5%, and shortleaf pine and black walnut at 4% each.



Trees Work by providing renewable materials to satisfy our need for wood-based goods, and by supporting wood-using companies that provide jobs in our local economies.

7

Forest Health Threats: Exotic and Invasive Plants, Animals, Diseases, Extreme Weather, and Climate Change

Missouri's forests are vulnerable to a number of current and potential forest health stressors. Exotic and invasive plants (such as honeysuckle, garlic mustard, and ironwood), insects and diseases (such as emerald ash borer, gypsy moth, and thousand cankers disease of black walnut), large animals (feral hogs, livestock, and overpopulated deer), and extreme weather events are posing increasingly detrimental impacts to our forests. Proactive measures are needed in order to avoid preventable forest health issues and minimize harm from health stressors that arise.

Goals

- Forest management options not being compromised by exotic or invasive plants, animals, and diseases.
- Gaining a thorough knowledge of the geographical extent and potential future threats of various exotic and invasive plants, animals, and diseases, and for widespread knowledge and practice of the most effective and efficient methods for preventing and dealing with them.
- Missouri's forests being managed to ensure the highest degree of adaptability through enhancing resilience and diversity and maintaining forest health.
- Healthy, adaptive forests that will continue to provide benefits such as clean water and air and potentially moderating the effects of climate change.

Strategies

Insect and Disease Threat

- Monitor the current and potential range and extent of new and existing forest insect and disease threats. Strive for early detection of new forest health threats in order to minimize harm and increase the affordability and effectiveness of management strategies.
- Develop, maintain, and implement strategic plans for known forest insect and disease pests that pose high current or potential threat.
- Conduct and compile research on the most effective and efficient methods for addressing tree insect and disease pests.

Deer

- Monitor deer browse impacts where this is a concern and recommend modifying hunting regulations as needed.

Invasive Plant Threat

- Develop geographic information on the range, extent, and level of threat of invasive plants detrimental to forest health.
- Develop and implement a strategic plan for protecting forests from exotic and invasive plants in the most effective and efficient manner possible.
- Conduct and compile research on the most effective and efficient methods for addressing exotic plant species outbreaks.

Forest Health Communications

- Improve communications and awareness of forest health threats to the public to help citizens identify threats, avoid their establishment, and appropriately address detected outbreaks and occurrences.

Forest Resiliency

- Improve the overall health of trees and forests in order to make them as resilient as possible to miscellaneous forest health threats.

Feral Hog

- Reduce or eradicate feral hogs.

Livestock Exclusion

- Promote the benefits of excluding livestock from the woods, and provide financial resources to landowners to make this possible.

Forest health threats come in a variety of forms

■ The emerald ash borer (EAB) is an Asian beetle that has killed millions of ash trees since its original North American detection in Michigan in 2002. EAB was first detected in Missouri in 2008 in a campground at Lake Wappapello in Wayne County in southeastern Missouri. This population had expanded to adjacent counties by 2012. An additional EAB infestation was discovered in the Kansas City area in 2012. There are over 400,000 ash trees inside the Kansas City city limits, and approximately 9.5 million in the nine-county metro KC area. Emerald ash borer will likely cause large numbers of ash trees to die. These will have to be removed before they become hazards, and there will be huge amounts of dead wood that will need to be disposed of.

■ People moving firewood provides a perfect means to introduce many forest pests to new areas, often covering large distances at a much faster rate than would occur naturally. The bugs or diseases hitch a ride in the unprocessed wood and then escape into their new home. This is most likely how emerald ash borer came to Missouri.

■ Missouri's black walnut trees are at risk from thousand cankers disease (TCD), which started in the western United States. The disease-causing fungus is spread by tiny wood-boring beetles easily transported in unprocessed walnut wood.

■ Drought is an important source of stress in trees. Stressed trees are less able to repel attacks by insects and diseases. Although drought kills some trees immediately, mortality can be seen for several years after a drought as the effects of insect and disease attacks accumulate over time.



Emerald Ash Borer



Drought Stress



Invasive Plants



Feral Hogs



Destructive pests, severe weather, and invading plants threaten the way **Trees Work** and the benefits they provide.

8

The Role of Trees in Improving Quality of Life and Sustainability in Cities

Trees and woodlands in our towns and cities provide numerous social, economic, and environmental benefits. These trees decrease and clean storm-water runoff, improve air quality, reduce the heat island effect, provide wildlife habitat, increase aesthetics, decrease energy demands, and much more. Maintaining and enhancing urban forest resources requires an understanding of the value of the benefits trees provide, knowledge of the current condition of a community's trees, and maintaining them properly. Local decision makers must be aware of all these factors so they can more easily plan and justify investments to maintain a healthy community forest resource.

Goals

- Healthy and sustainable urban and community trees and forests supporting desirable and environmentally healthy places of residence for Missouri citizens.
- Urban and community trees and forests contributing significantly to minimizing storm-water runoff, improving air quality, reducing heat islands, reducing energy consumption, and more.
- Establishing widespread recognition of trees and forests as important components of city and community infrastructure that need to be maintained and adequately funded.

Strategies

Public Awareness

- Increase awareness of the general public and local decision makers regarding the public benefits of urban trees and forests to the point that they demand the establishment and maintenance of green infrastructure and are willing to pay for it.
- Increase public awareness of the importance of proper tree species selection, planting, and maintenance practices, and provide training to municipalities, commercial arborists, utility workers, and homeowners.
- Publicly recognize arborists, volunteers, and others for quality work and contributions.

Technical Assistance and Management

- Promote the use of International Society of Arboriculture–Certified Arborists and Society of American Foresters–Certified Foresters who are trained and certified to manage urban forests.
- Provide technical assistance to communities for developing comprehensive community forestry programs.
- Diversify urban forests by promoting the use of native species and cultivars that are not as well-known, but desirable for urban landscape use.
- Gather data to accurately monitor and assess urban forests.
- Develop cost-effective and resourceful methods of utilizing wood waste.

Development Best Management Practices

- In concert with partners, create and publicize demonstrations of conservation-friendly development Best Management Practices.





- Each mature urban tree absorbs between 120 and 240 pounds of air pollutants every year.
- National research shows that property values are increased 1% by each tree in the yard.
- The shade from three strategically placed trees can reduce a home's cooling needs by 50%.



Trees Work in our communities by reducing storm-water runoff, improving air quality, and providing shade to reduce energy consumption.

9

Public Lands Managed for the Greatest Public Good

Public lands and other protected lands are important assets that are highly valued by society. Beyond the normal benefits and services provided by forests, public forest lands are especially important because they are typically managed under agency mandates for sustainability and conservation, and they are generally protected from conversion to other uses such as urban development. Furthermore, due to size, location, and management objectives, public forests offer many of Missouri's best opportunities to maintain biodiversity and provide high-quality recreational opportunities. Sustaining the benefits of public forest land will require maintaining sufficient funding for management and carefully balancing the demands of a diverse public and the needs of a healthy forest resource.

Goals

- Public forest lands continuing to provide numerous benefits and services, including opportunities for recreation.
- Citizens being aware of public lands and their availability, benefits, and issues, as well as the need to actively manage public forests to maintain their health.
- Public lands being managed sustainably to provide multiple benefits (recreation, wildlife habitat, ecosystem services, timber, aesthetics, etc.), and to serve as models for private landowners.

Strategies

Forest Management

- Maintain recreational facilities to provide sufficient and cost-effective public recreational opportunities.
- Manage and maintain public lands in a way that minimizes potential conflicts and impacts between different user groups and interest groups.
- Manage public land in a way that demonstrates sustainable forest management practices, providing examples for others to follow.

Forest Planning

- Develop forest area plans to formalize and guide management objectives and strategies on specific public ownerships.
- Develop better public trust and awareness of public land management needs and activities through enhanced communication, transparency, and stakeholder input.
- Foster better communication and collaboration between all public forest land management agencies

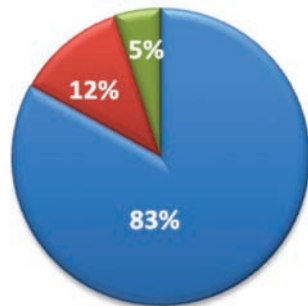
Forest Land Conservation

- Develop and implement a strategic forest land conservation program to 1) Acquire or otherwise protect tracts key to maintaining or enhancing the conservation value and other important public benefits of existing public lands; and 2) Dispose of tracts that offer minimal conservation or public value, replacing them with equal acreage of greater public value.





Missouri Forest Land Ownership, 2010



- Private
- Federal
- State & Local



Trees Work on public lands to provide a range of benefits for Missouri citizens.

10

Maintaining Biodiversity (Wildlife Diversity)

Missouri's forests support a great diversity of plants and animals, and forests and wildlife are strongly interconnected. Each state was charged by Congress to create a Wildlife Action Plan in order to make the best use of federal wildlife grants; Missouri's plan is titled the Comprehensive Wildlife Strategy. This plan was created to maintain and enhance the diversity of plants and animals, and the habitats that support them. Threats and opportunities facing Missouri's forest and woodland biodiversity are virtually identical to forest sustainability issues. Therefore, the Wildlife and Forest Action Plans should work together very closely to achieve overlapping goals.

Goals

- Wooded natural communities being restored and/or maintained through proper management.
- Stabilizing populations of Species of Conservation Concern, including Threatened and Endangered species, that rely on forest habitats.
- Missouri's forests continuing to provide a diversity of healthy, functioning natural communities for the plants and animals that depend on them.

Strategies

Natural Community Restoration and Maintenance

- Maintain and restore forests, woodlands, glades, and savannas that are well suited to their growing sites, address wildlife habitat needs, and are most resilient to forest threats.

Forest Land Action Guidelines

- Maintain and utilize MDC's Forest Land Action Guidelines to help guide forest management decision making on MDC forests, and on other forest ownerships as land managers find appropriate.

Comprehensive Wildlife Strategy

- Work with and utilize the Comprehensive Wildlife Strategy process to maintain and enhance Missouri's biodiversity.

Natural Areas Program

- Recognize the best examples of healthy forest and woodland community types and manage them to maintain their integrity.

Wildlife Population Data and Target

- Establish baseline data and targets for forest wildlife habitat initiatives.





■ The Ozark hellbender, found in the cold, clear rivers of southern Missouri and northern Arkansas, was added to the federal endangered species list in 2011. Hellbenders are one of the largest species of salamanders in the world, with adults approaching two feet in length at maturity. After a decade of effort by MDC and the Saint Louis Zoo, Ozark hellbenders were bred in captivity for the first time at the zoo from wild parents in 2011. Forests along stream banks help maintain the cold, clear water required by hellbenders by stabilizing the banks, shading the water to help keep it cool, and filtering out pollutants.



■ Missouri is home to two endangered bat species: the gray bat and the Indiana bat. Gray bats eat a variety of flying aquatic and terrestrial insects present along rivers or lakes. Indiana bats also eat a variety of flying insects found along rivers or lakes and in uplands. Like all insect-eating bats, they benefit people by consuming insects that are considered pests. Indiana bats eat up to half their body weight in insects each night. Forests provide summer roosting habitat for bats as well as helping to maintain healthy streams where bats forage for insects.



A diversity of plants and animals is possible
because **Trees Work** to keep ecosystems healthy.

11

Logistical Framework for Sustainability

Today's actions will have a significant impact on the future health and sustainability of our forest resources and the future benefits these resources will provide. Sustaining forest resources requires adequate funding as well as a diversity of partnerships and people collaborating on the implementation of strategies that are as efficient, effective, and synergistic as possible. Above all, sustainability of Missouri's forest resources requires that Missourians understand and appreciate the value of forest resources, the issues facing them, the opportunities they present, and the role people play in determining the future of the forest.

Goals

- Public agencies working efficiently and effectively toward sustainability of Missouri's forest resources and the services they provide.
- Various public and private forest stakeholders collaborating effectively to generate new ideas and knowledge, feed off of each other's strengths, and increase dialogue.
- Sufficient funding being available and widely supported by Missouri citizens to ensure the sustainability of Missouri's forests and the services they provide.
- Missouri citizens understanding and appreciating the value and diverse benefits of Missouri's forest resources, and the threats facing their sustainability.
- Missouri citizens understanding the need for and supporting proactive management to maintain the health and sustainability of Missouri's forest resources.
- Missouri citizens understanding their role in determining the future sustainability of Missouri's forest resources.

Strategies

- Establish collaborative "Priority Forest Landscape" and "Urban Forest Opportunity Area" stakeholder groups to develop and implement objectives and strategies specific to established priority geographies.
- Utilize the Missouri Forest Resources Advisory Council as a means of collaboration and communication of prominent forestry issues between Missouri's forestry agencies and partner organizations.
- Utilize the Missouri Community Forestry Council as a means of collaboration and communication of prominent urban and community forestry issues between forestry agencies and partner organizations.
- Inventory and monitor forests and forest product trends to ensure harvest rates remain sustainable, to facilitate sustainable forest management decisions, and to help prioritize forestry efforts.
- Explore the feasibility and desirability of establishing forest-friendly legislation.
- Recruit concerned citizens and volunteers to assist with activities toward sustainability of Missouri's forest resources.
- Develop and implement a comprehensive forestry communications and marketing strategy for building awareness of Missouri's forest resources and their associated benefits, threats, and opportunities.
- Increase the connection and engagement of the general public, especially youths, to the trees, forests, and natural world that support their quality of life.



Trees Work for all Missourians, and all Missourians have a role in ensuring the future of our trees and forests, whether in rural areas or in more urban settings.

Other Resources to Help You Get Involved

Whether you own woods or not, below are ways you can get involved.

- **Missouri's Forest Action Plan** is the first step toward ensuring the future of our woodlands. However, success depends on partnerships at all levels; between private citizens, local landowners, private organizations, local governments, and state and federal agencies. Transform your interest and concern about our woodlands into action! For more information, please visit www.forestactionplans.org
- **Forest and Woodland Association of Missouri:** for anyone interested in Missouri's forests. www.missouriwoodland.org
- **Missouri Forestkeepers Network:** a free volunteer program for those interested in back yard trees or a larger patch of woods. www.forestkeepers.org
- **Missouri Heritage Woods:** a recognition program for landowners interested in forest management and own at least three acres of woods. www.forestkeepers.org/mentor.html
- **Missouri Tree Farm:** for landowners interested in active forest management and sustainability certification, and own at least ten acres of woods. www.moforest.org/treefarmssystem.html







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